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Instream Flow Protection in Alaska, 2013

by

Joe Klein

April 2014

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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INSTREAM FLOW PROTECTION IN ALASKA, 2013

by

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ABSTRACT

This report summarizes instream flow protection and related activities of the Alaska Department of Fish and Game (ADF&G) in 2013. The status of reservation of water applications by other agencies and the private sector in Alaska is also presented.

In 1986, ADF&G created the Statewide Aquatic Resources Coordination Unit (SARCU) within the Division of Sport Fish to address instream flow related activities. Of the 468 applications received by Alaska Department of Natural Resources (DNR) from 1980 to 2013, ADF&G filed 213 river reaches and 4 lake applications and was granted certificates of reservations for 79 river reaches and one lake. In 2013, ADF&G filed 21 applications for river reaches and was granted certificates for 25 river reaches.

ADF&G has continued to exceed the program goal of filing 10 reservations annually. From 2009 to 2013, an average of 16.2 and 10.6 applications were filed and granted, respectively. This is up from the 1998 to 2008 average of 3.4 and 1.4 applications filed and granted, respectively. Factors contributing to this improvement include: ADF&G and DNR leadership making reservations a priority, signing of an MOU with DNR which created the vision and framework for reducing the backlog, and efficiencies gained through a better understanding of the adjudication process.

SARCU staff performed hydrologic investigations on eight projects in 2013. Investigations were generally performed to provide the necessary data to complete reservation of water applications. SARCU staff monitored 63 hydroelectric and hydrokinetic projects and served as ADF&G's representative for the Alaska Clean Waters Actions (ACWA) program. ACWA funded 14 projects in state fiscal year 2013 (July 1, 2012 through June 30, 2013).

Key words: instream flow, reservation of water, Alaska Water Use Act, Peterson Creek, Eagle Lake, Orchard Lake, Turner Lake, Thorne River, Windfall Creek, Meadow Creek, Fish Creek, Federal Energy Regulatory Commission, hydroelectric, hydrokinetic, Alaska Clean Water Actions

INTRODUCTION

The State of Alaska has abundant and diverse sport fisheries that are of considerable recreational importance to anglers and others. To date, 18,120 water bodies in Alaska have been identified as supporting anadromous fish species (personal communication, J. Johnson, Habitat Biologist, Alaska Department of Fish and Game, January 22, 2014).

In 2012, an estimated 443,826 anglers fished 1,885,768 days and harvested approximately 2,470,395 of the estimated 5,612,181 fish caught in Alaska (Romberg et al. *In prep*). The continued production of these fishery resources depends, in part, upon sufficient amounts of good quality water to maintain seasonal fish habitat in rivers and lakes. Fish and other aquatic and terrestrial organisms have adapted to natural streamflows that provide essential seasonal habitats utilized by the various life stages of each species. Varying seasonal quantities of flowing waters and lake elevations are needed by fish using freshwater and estuarine habitats for migration, spawning, incubation, and rearing. (Hynes 1970; Estes 1984; Hill et al. 1991; Poff et al. 1997; Bovee et al. 1998; Annear et al. 2004).

The Fish and Game Act requires Alaska Department of Fish and Game (ADF&G) to "...manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state" (AS 16.05.020). The act also enables ADF&G to use a variety of legal, regulatory, and administrative options to quantify and acquire water rights within lotic[1] and lentic[2] water bodies to sustain fish and wildlife resources

[1] Lotic refers to flowing waters such as rivers and streams.

[2] Lentic refers to still waters such as lakes and ponds.

(AS 16.05.050). Fish habitat permits (AS 16.05.841 and .871) issued by the department are one of the tools that can be used to maintain sufficient amounts of water to protect fish habitat in lotic and lentic fish-bearing systems. For decisions that have the potential to impact a fish-bearing water body, ADF&G and the Alaska Department of Natural Resources (DNR) have agreed to coordinate water right and fish habitat permits to ensure permit conditions are consistent.[3]

In 1980, Alaska's water law was amended to allow protection of instream flows in rivers and water levels in lakes, commonly referred to as Alaska's instream flow law. Alaska's water law treats the term *instream flow* more broadly than most states' jurisdictions because the term may be used to refer to the rate or volume of flow in a river, the volume of water in a lake, or a related physical attribute such as water depth for identified resources and values. Water rights to retain water in lentic and lotic habitats can be acquired from DNR by a private individual, group, or government agency for one or a combination of four purposes:

1. protection of fish and wildlife habitat, migration, and propagation;
2. recreation and park purposes;
3. navigation and transportation purposes; and
4. sanitary and water quality purposes.

Alaska's water law follows the prior appropriation doctrine which assigns seniority of water rights in the order they are filed (Alaska Constitution, Article VIII, Section 13). Under Alaska water law, an appropriation to retain water within a water body for any of these purposes may also be defined as a "*reservation of water*" (AS 46.15.145). The term, "*reservation of water*" is often used to differentiate between retaining water within lotic or lentic water bodies versus out-of-stream withdrawals.[4] It is important to note that passage of the instream flow law expanded the meaning of *appropriation* in Alaska to represent all water right uses, including retention of water in lotic and lentic water bodies. However, an *appropriation* is still more commonly associated with out-of-stream and diversionary uses/water rights while the term *reservation* typically refers to retention of water within a lotic and lentic water body. Further information related to Alaska's instream flow law can be found in Curran and Dwight (1979), White (1982), Anderson (1991), Harle and Estes (1993), Spence (1995), and Burkardt (2000).

In 1986, ADF&G created the Statewide Aquatic Resources Coordination Unit (SARCU) within the Division of Sport Fish (SF) to acquire reservations of water in priority fish-bearing water bodies. Over time, duties were expanded to address other instream flow related issues such as hydroelectric licensing under the Federal Energy Regulatory Commission (FERC) and representation in the Alaska Clean Waters Action (ACWA) program. SARCU staff also developed the capacity to collect hydrologic data for filing reservation of water applications. This report summarizes instream flow protection activities by ADF&G in 2013 and the status of reservation of water activities conducted by other agencies and the private sector.

RESERVATIONS OF WATER

To file for a reservation of water, an application must be completed, signed, and submitted to DNR with the appropriate application fee, if applicable.[5] Applications are prepared to comply

[3] Memorandum from F. Rue, ADF&G Director of Habitat Division to G. Gustafon, DNR Director of Division of Land and Water Management, August 10, 1989 reaffirmed by ADF&G and DNR on December 16, 2009.

[4] Withdrawals can be from surface or subsurface water sources.

[5] There is no charge to state agencies.

with requirements established by state law (AS 46.15.145), state regulations (11 AAC 93.141-147), reservation of water application form instructions, and the *State of Alaska Instream Flow Handbook* (DNR 1985) when applicable. An applicant can apply for a reservation to secure their interest and obtain a priority date and will have 3 years to collect any additional data; a 2-year extension can be obtained with approval from DNR [11 AAC 93.142 (4)]. The following is an overview of the reservation of water process.

Nominations

ADF&G developed nomination work plans for SF Regions 1, 2, and 3 (Figure 1; Klein 2011). These work plans served as the basis for coordinating with regional management and research staff to nominate water bodies for instream flow protection. Nomination reviews were coordinated by SF regional research coordinators and included input from other staff or agencies that had information on fish resources and/or future water uses in the region.

Final selection of water bodies to be reserved was made by the SARCU supervisor in consultation with SF regional supervisors or their designees. In general, final selections were based on the importance of a water body to fishery resources, the likelihood for competing out-of-stream uses, the amount of existing hydrologic data, and the availability of other mechanisms[6] to provide instream flow protection.

Data Compilation, Collection, and Analysis

A reservation of water application needs to include information that substantiates the amount of streamflow or level of water being requested for the selected purpose(s). Applications prepared by ADF&G included biological and hydrologic data to support reservations of water for the protection of fish habitat, migration, and propagation. ADF&G strives to collect and analyze all data according to accepted scientific methods and procedures that would meet evidentiary standards and any challenges[7] that may be filed.

Biological Data

A variety of sources were used to obtain information needed to document fish use in the selected water body. This information typically included fish distribution and life history periodicity[8] data that were summarized from ADF&G biologists, scientific literature, and the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* (Johnson and Blanche 2011).

Hydrologic Data

DNR recommends a minimum of 5 years of continuous streamflow or lake level data to support water right decisions including reservation of water applications (Gary Prokosch, Chief Water Resources Section, ADNR, April 26, 2005, personal communication). This 5 year recommendation is intended to reduce potential bias that may be associated with intra- and inter-annual hydrologic variability.

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[6] Other mechanisms may include fish habitat permits, water right permits, Clean Water Act permits (Section 401 Water Quality Certification, Section 402 National Pollution Discharge Elimination System, and Section 404 Dredge and Fill permits), permits from land management agencies, and the Federal Power Act.

[7] Challenges may be filed by an aggrieved party to contest the validity of the data set, analyses, and rationale for the requested amount of water the department considers necessary.

[8] Seasonal use of habitat by species and life stage for passage, spawning, incubation, and rearing.

When available, streamflow data for describing seasonal and long-term hydrologic characteristics and quantifying instream flow needs were obtained from the U.S. Geological Survey (USGS) National Water Information System (NWIS) website.[9] When hydrologic data were limited or not available, SARCU collected streamflow data in accordance with USGS standards (Rantz and others 1982; Klein 2013). Streamflow records were computed using the Water Information System Kisters Incorporated (WISKI)® hydrologic data management software after they were proofed for errors and transformed into a WISKI® compliant format. WISKI® is a Windows-based professional time series hydrologic management system that meets USGS standards for data computation. Streamflow records obtained from USGS or collected by SARCU were analyzed using the most current version of the SAS® statistical software package with support from SF biometricians.

Where less than 5 years of data were available, simple linear regression was used to extend the streamflow record if a suitable, long-term streamgage was available (Klein 2013).

Instream Flow Analysis

Under Alaska law, applicants are not required to use a specific method for quantifying instream flow needs (11 AAC 93.142; DNR 1985). The burden is on the applicant to choose and defend the approach used.

ADF&G used hydrologically based approaches combined with fish use information to quantify instream flow needs for fish. These included analyses based on historic streamflow data (Annear et al. 2004) and variation of the Tennant Method (Estes 1998; Tennant 1976) to account for local hydrologic and biological conditions. ADF&G recommended streamflow regimes similar to the magnitude and timing of the natural streamflows to maintain seasonal use of fish habitat.

Hydrologic characteristics of a river were used as the primary basis to delineate reaches. This information came from various sources including: USGS topographic maps, ADF&G Anadromous Waters Catalog for the appropriate region (e.g. Arctic Region; Johnson and Blanche 2011), ADF&G Freshwater Fish Inventory[10], and USGS National Hydrography Database[11]. Reach boundaries were based on documented fish presence then further refined to minimize differences in streamflow. Major tributaries upstream and downstream of the chosen reach were generally selected as reach boundaries.

Adjudication

Adjudication is the legal process of determining the validity and amount of a water right and includes the settlement of conflicting claims among competing appropriators of record [11 AAC 93.970(1)]. Once DNR makes a determination on the amount of water to reserve, the public is provided 15 days to comment. After reviewing all public comments and if no further administrative actions are needed, DNR prepares a "Finding of Fact, Conclusion of Law and Decision" document that describes the information and rationale used for the decision and issues a Certificate of Reservation of Water. The certificate is recorded in the State Recorders Office and includes a description of the water right, any conditions placed on it, and the priority date which establishes the seniority of the water right. If DNR's decision is challenged, there is an

[9] See http://waterdata.usgs.gov/ak/nwis/sw.

[10] See http://www.sf.adfg.state.ak.us/SARR/Surveys/index.cfm

[11] See http://nhd.usgs.gov/data.html

administrative appeal process with the option to seek further remedy through Alaska's court system.

In 2002, a Memorandum of Understanding (MOU) was signed between DNR and ADF&G to assist with the increasing backlog of reservation of water applications needing adjudication and to improve the overall process. As part of the agreement, ADF&G partially funds a position at DNR to adjudicate applications. This position also provides assistance with preparing applications and other instream flow related needs. DNR and ADF&G also meet annually to prepare a work plan that prioritizes applications to adjudicate in the coming year and discuss any instream flow related issues.

ACTIVITIES

RESERVATIONS OF WATER

From 1980 to 2013, ADF&G filed reservation of water applications on 213 river systems[12] and 4 lakes[13] from a total of 468 applications received by DNR (Figures 2 and 3 and Table 1). Certificates of reservation were granted to ADF&G for 79 river reaches and one lake and for one river reach and lake under the water export provision[14] (Figures 4 and 5). In 2013, ADF&G filed 21 applications (Table 2) and received 25 certificates of reservation providing protection for approximately 301 miles of fish habitat (Table 3).

ADF&G has continued to exceed the annual program goal of filing 10 reservations annually (Figure 6). From 2009 to 2013, an average of 16.2 and 10.6 applications have been filed and granted, respectively. Whereas, from 1998 to 2008 an average of 3.4 and 1.4 applications had been filed and granted, respectively. Factors contributing to this improvement include: ADF&G and DNR leadership making reservations a priority, signing of an MOU with DNR which created the vision and framework for reducing the backlog, and efficiencies gained through a better understanding of the adjudication process.

HYDROLOGIC INVESTIGATIONS

Hydrologic investigations were generally performed to obtain data to either support a new reservation of water application or amend a prior application. Investigations were performed on eight projects in 2013 (Figure 7). Summaries of each investigation by SF regions[15] are provided below.

Region I

SF Region I encompasses Southeast Alaska from Cape Suckling to Dixon Entrance (Figure 1).

Peterson Creek near Amalga Harbor

Peterson Creek is located 19 miles northwest of Juneau (Figure 7) and supports populations of coho salmon (*Oncorhynchus kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta),* steelhead (*O. mykiss*), cutthroat trout (*O. clarki*), and Dolly Varden (*Salvelinus malma*).

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[12] Includes seven reservation of water applications that were filed with project partners (see Table 1).

[13] The number of reservations previously reported was incorrectly calculated.

[14] Water exported out of one of the six defined hydrologic units requires a mandatory reservation to protect fish resources (AS 46.15.035).

[15] The state is divided into three SF administrative regions – Southeast, Southcentral and Southwest, and the Arctic-Yukon-Kuskokwim regions. Each region roughly corresponds to the Alaska Board of Fisheries regulatory areas.

Peterson Creek drains out of Peterson Lake and flows downstream five miles to a salt chuck before eventually entering Amalga Harbor. A barrier falls is located 2.5 miles upstream from the salt chuck and prevents anadromous fish from accessing the upper creek and lake. The watershed has a drainage area of approximately 10 square miles. The majority of the Peterson Creek watershed is within the Tongass National Forest. The lower portion of watershed near Glacier Highway is owned by the City and Borough of Juneau.

Peterson Creek is a popular steelhead fishery for Juneau area anglers. It also serves as a steelhead index stream for the ADF&G Division of Sport Fish snorkel survey project. An ADF&G Division of Sport Fish weir on the creek monitored steelhead immigration from 1989 to 1991. During this study, an average of 205 steelhead immigrated into the creek each year.

ADF&G installed streamgage 13601 at Peterson Creek on September 27, 2012 (Sowa 2013a). This streamgage will continue to operate until October 1, 2017, or until five years of streamflow data has been collected. Site visits were made to the gage 17 times during 2013 to download transducer data, take discharge measurements, and for routine streamgage maintenance. After one complete water year of streamgage data has been collected and analyzed, a reservation of water application will be filed to obtain a priority date for the protection of fish habitat on approximately 0.5-mile of creek.

Turner, Eagle, and Orchard Lakes

ADF&G received funding provided by the National Fish Habitat Action Plan via a grant from the Western Native Trout Initiative (WNTI) to collect hydrologic data for reservations of water applications on three trophy cutthroat trout lakes in Southeast Alaska. Turner, Eagle, and Orchard lakes were chosen for this project. Turner Lake is located 16 miles east of Juneau near Taku Inlet; Eagle Lake is located 48 miles south of the town of Wrangell; and Orchard Lake is located 35 miles north of the town of Ketchikan (Figure 7).

ADF&G has operated lake level gages on these lakes since the fall of 2010. In 2013, three site visits were made to Turner Lake in June, July and October and two sites visits were made to Eagle and Orchard lakes in May and October. These site visits included downloading transducer data, measuring current lake level relative to an established benchmark, taking pictures of site conditions, and performing routine gage maintenance.

The lake level gages will remain in operation until October 2015 or until five years of lake level data have been collected. Using one year of hydrologic data, reservation of water applications reserving lake levels have been filed and accepted for Eagle, Orchard, and Turner Lakes. After hydrologic data collection is complete and analyzed, these reservation applications will be amended, if necessary.

Thorne River

Thorne River is located in Southeast Alaska on Prince of Wales Island (Figure 7). With approximately 113 anadromous river miles, the Thorne River is the largest stream system on Prince and Wales Island and supports populations of coho, chum, sockeye and pink salmon, cutthroat and steelhead trout and Dolly Varden. Thorne River is a popular sport fishery as well as an important subsistence fishery for Prince of Wales Island residents.

ADF&G has operated Stream Gage 13501 on the mainstem of the Thorne River since August 2012 (Hass 2013). Site visits were made to the gage 6 times during 2013 to download data, take discharge measurements, and perform routine gage site maintenance.

ADF&G installed three discharge measurement stations on tributaries to the Thorne River in 2012 which included the North Thorne River, Goose Creek, and Rio Beaver. In 2013, discharge measurements were collected at each station as follows: six measurements at North Thorne River, six measurements at Goose Creek, and four measurements at Rio Beaver.

Stream Gage 13501 and all three discharge stations will remain in operation until October 2017 or until five years of streamflow data have been collected. After one complete water year of hydrologic data has been collected and analyzed, a reservation of water application reserving instream flows within 5 miles of the mainstem will be filed. After two complete water years of hydrologic data has been collected and analyzed at the tributary stations, reservation of water applications reserving instream flows within 13 miles of the tributaries will be filed.

Windfall Creek near Juneau

Windfall Creek is located 18 miles northwest of Juneau (Figure 7) and supports populations of coho salmon, pink salmon, chum salmon, sockeye salmon (*O. nerka*), steelhead, cutthroat trout, and Dolly Varden.

Windfall Creek drains out of Windfall Lake and flows downstream 0.5 miles to a side channel of the Herbert River (Figure 7). Two tributaries flow into Windfall Lake; Windfall Creek which enters into the southwest corner of the lake and an unnamed creek which enters from the southeast. The entire watershed is located within the Tongass National Forest.

The creek is a popular fishery for Juneau area anglers; it is the only Juneau area stream where anglers can catch and retain sockeye salmon. There also is a United States Forest Service public use cabin located on the northeast shore of the lake that can be accessed by a 3.2 mile long trail.

An ADF&G fish weir was operated in the spring of 1997. Fish passage included 616 cutthroat trout, 34,074 Dolly Varden, and nine steelhead outmigrating from Windfall Creek (Jones and Harding 1998). Immigrating sockeye salmon were counted at ADF&G fish weirs in 1989 and 1997 and the total return was estimated to be 4,667 in 1989 and 4,228 in 1997 (Bethers and Glynn 1990, Yanusz 1998). ADF&G has also conducted foot surveys of spawning sockeye salmon in Slate Creek, a tributary to Windfall Creek above Windfall Lake (Figure 2), since 1990.

ADF&G installed streamgage 13801 at Windfall Lake on June 17, 2013 (Sowa 2013b). Site visits were made to the streamgage four times during 2013 to install the streamgage, download transducer data, take discharge measurements, and perform routine streamgage maintenance. This streamgage will continue to operate until October 1, 2017, or until five years of streamflow data has been collected. After one complete water year of streamgage data has been collected and analyzed, a reservation of water application reserving instream flows within 0.5 miles of the mainstem will be filed.

Region II

SF Region II covers portions of Southcentral and Southwest Alaska including Prince William Sound, Kenai Peninsula, Kenai River Drainage, Cook Inlet–Resurrection Bay Saltwater, Anchorage Bowl Drainages, Knik Arm, Susitna River Drainage, West Cook Inlet, Kodiak, Bristol Bay, and the Alaska Peninsula and Aleutian Islands (Figure 1).

Meadow and Fish Creeks

Meadow and Fish Creeks are located in the Big Lake drainage near Wasilla, Alaska (Figure 7). In 1988 ADF&G filed reservation of water applications with DNR for two reaches (“upper” and

"lower") on Fish Creek and one reach ("lower") on Meadow Creek. Streamflows requested in these applications were based on regional regression analyses and supported by only a few instantaneous discharge measurements. Seasonal flow variability was based on nearby Cottonwood Creek. To complete adjudication of these applications, DNR requested and ADF&G agreed that 5-years of continuous streamflow data should be obtained.

From 2008 to November 2013, SARCU received Alaska Sustainable Salmon funding to collect and analyze the hydrological and biological data necessary to quantify instream flow needs for fish in Meadow and Fish Creeks. ADF&G installed gages on lower Fish Creek and lower Meadow Creek, and established discharge measurement stations on upper Fish Creek and "upper" Meadow Creek (also called Little Meadow Creek). ADF&G contracted the Wasilla Soil and Water Conservation District to measure discharge and collect water quality information (dissolved oxygen, specific conductivity, pH, nitrates, phosphorus, fecal coliform). Water Walkers Streamflow Monitoring, Inc. was contracted to analyze the streamflow data from the gaging stations. ADF&G will use the gage data to determine flows on Meadow and Fish Creek ungaged reaches. All pending reservations of water applications that have been filed on these water bodies will be amended with the 5 years of streamflow data after data processing, which is expected to occur in 2014. When this is completed, 14 river miles on Fish Creek and and 12.1 river miles on Meadow Creek will have instream flow protection.

HYDROELECTRIC PROJECT LICENSING

FERC administers the Federal Power Act (FPA), which governs the regulation of hydroelectric projects in the United States, among other duties. FERC issues licenses[16] that specify how projects will be constructed and operated including any protection, mitigation, and/or enhancement requirements. FERC licenses specify how streamflows will be allocated between energy generation and other beneficial uses recognized by the FPA and other applicable laws (Roos-Collins and Gantenbein 2005).

The FPA affords considerable weight and due deference to ADF&G, as the state's fish and wildlife agency. If FERC does not accept all of ADF&G's recommendations, they must attempt to resolve any such inconsistency, giving due weight to the department's authority and expertise. Each project is unique, requiring reviews and analyses specific to affected resources.

Prior to 1998, ADF&G's review of FERC hydroelectric projects was handled on a regional basis. To provide better consistency and interdepartmental coordination, a position was created in SARCU to oversee statewide coordination efforts for all FERC jurisdictional projects and to ensure all legal and administrative requirements are met. Under the FERC process, applicants obtain a preliminary permit that gives them the exclusive right to study the project's feasibility. If an applicant is interested in pursuing the project, a license application is submitted before the end of the permit term. ADF&G plays an important role in assisting the applicant to obtain fish and wildlife information needed for project review.

The Hydropower Regulatory Efficiency Act was passed in 2013. The act, among other things, redefines "small hydroelectric power projects" as having an installed capacity that does not exceed 10,000 kilowatts and authorizes the Commission to extend the term of preliminary permits once for not more than 2 additional years beyond the 3 years previously allowed. The

[16] A FERC license has a term of 30 to 50 years, subject to renewal.

ability to extend preliminary permits in Alaska is expected to ease the burden on applicants and resource agencies and should result in more collaborative and informed license applications.

In 2013, SARCU monitored 63 FERC hydroelectric and hydrokinetic projects (Table 4). Interest in hydroelectric power has increased recently and is expected to continue for the foreseeable future as energy prices remain high and the state seeks solutions for the railbelt's[17] aging power generation infrastructure.

ALASKA CLEAN WATER ACTIONS PROGRAM

The ACWA program was created through Administrative Order 200 and brings together the three state resource agencies, Alaska Department of Environmental Conservation (DEC), ADF&G, and DNR to characterize Alaska's waters in a holistic manner that included the sharing of relevant data and expertise. ACWA's database of priority waters and identified stewardship actions is a product of this collaboration[18].

The three state resource agencies also conduct an annual joint matched-solicitation for water quality projects using funds that are passed through from federal monies. Projects to restore, protect, or conserve water quality, quantity, and aquatic habitat on identified waters are considered. Local governments, citizen groups, tribes, and education facilities are often the recipients of these awards.

Each agency is responsible for collecting and assessing water body information related to its expertise. ADF&G assesses aquatic habitat, DEC assesses water quality, and DNR assesses water quantity. Water body assessments start when a water body is nominated into the ACWA database for specified concerns. Water bodies can be nominated by agency personnel or by concerned members of the public. Each agency evaluates the sufficient and credible information available and assigns a priority ranking based on specific criteria for each type of water body issue. A decision tree is used to identify a needed action for each nominated water body in one of four categories:

1. Data Collection
2. Recovery
3. Protect and Maintain Water bodies at Risk
4. Adequately Protected Water bodies

ACWA staff rank each water body as high, medium, or lower priority based on criteria that evaluate threats, current condition, and resource value. High priority water bodies may go on to be eligible for project funding through the annual ACWA grant solicitation process. ACWA tracks information on all nominated water bodies through an interagency database. To date, there are 381 waters nominated into the ACWA program, 139 of which included water bodies ranked "high" by one or more agency.

In state fiscal year 2013 (July 1, 2012 through June 30, 2013), 14 projects were funded by ACWA (Appendix A). In addition, a comprehensive list of unfunded high priority actions was produced to address needs for restoration, protection, or monitoring for which funding was not

[17] Alaska's Railbelt region stretches from the Kenai Peninsula north more than 500 miles to Fairbanks. This region is named for areas reached by the railroad and is home to approximately 70 percent of Alaska's population (source: http://arctec.coop/ accessed April 4, 2014).

[18] Although the entire database is not available to the public, a list of all high priority waters and other information regarding these waters is available on DEC's website http://dec.alaska.gov/water/acwa/acwa_index.htm.

available or that were solicited for proposals but did not receive an application. For more information on ACWA including current and past funded projects and the list of unfunded high priority actions, go to www.state.ak.us/dec/water/acwa/acwa_index.htm.

DISCUSSION

ISSUES AND ACTIVITIES

During the majority of 2013, DNR was limited in their ability to process the backlog of pending reservations for two primary reasons. First, DNR's Water Resources Section (WRS) Chief position was vacant until November 2012 and time was needed following the appointment for the incumbent to transition into the position. Secondly, the new Chief directed a review and update of the *Finding of Facts, Conclusions of Law, and Decision* report (decision report) before adjudication of any new applications. A proposed change to limit the quantity of water to be reserved to below the ordinary high water mark (OHWM) was contested by ADF&G. After discussion and consultation with the Attorney General's office, an agreement was reached on October 2013. The agreement stated that the term, OHWM, would be used in the decision report solely for the purpose of describing the location of the water body and would include a statement clarifying, that reference to the OHWM does not limit the quantity of water reserved by the decision report or issued certificate to the OHWM boundary.

In January 2013, House Bill 77 (HB 77) and Senate Bill 26 were introduced by the Governor. The bills, among other things, would remove the ability of individuals, tribes, and non-governmental organizations to file for reservations. HB 77 was passed by the House of Representatives and is in the Senate Rules Committee when the legislature convenes in 2014.

HYDROLOGIC DATA NEEDS

The paucity of hydrologic data throughout most of Alaska limits ADF&G's ability to acquire reservations of water (Estes 1998; Brabets 1996). Although Alaska has approximately 40 percent of the nation's surface water outflow[19], only 521 USGS continuous streamgages have been established in Alaska (J. Conaway, USGS Hydrologist, Anchorage, Alaska, December 26, 2013, personal communication; Table 5). This equates to flow measurements for less than 1 percent of Alaska's water bodies; less than half of these could meet the USGS's 10 year-minimum historical record standard for supporting a statistically reliable regional flow analysis.

In federal Water Year 2013 (October 1, 2012 through September 30, 2013), USGS operated 123 continuous streamgages in Alaska. This represents approximately one streamgage per 5,000 square miles, which contrasts significantly with the western United States where there is approximately one gage site per 400 square miles. Of the streamgages operating in Water Year 2013, 24 were in Southeast, 48 were in Southcentral, and 51 were throughout the remainder of the state. (J. Conaway, USGS Hydrologist, Anchorage, Alaska, December 26, 2013, personal communication; Tables 5 and 6).

Baseline hydrologic data are needed by water resource agencies and water users for planning and management. Accurate estimates of available streamflows and lake elevations are needed for project designs and to manage and enforce water rights. Obtaining these data can be difficult and

[19] Alaska Hydrologic Survey website checked May 3, 2012 http://dnr.alaska.gov/mlw/water/hydro/components/surface-water.cfm

expensive, considering challenges that include Alaska's limited road systems, extreme weather conditions, and the loss of equipment to bears and other wildlife.

Without baseline hydrologic data, models must be used to estimate seasonal and long-term streamflow characteristics. On streams with limited or no streamflow data, using hydrologic models to predict long-term or seasonal flow characteristics is difficult and often produces estimates with high uncertainty. Furthermore, it is more time consuming to estimate streamflow characteristics for streams having limited or no data than it is to summarize data for a stream having an adequate hydrologic record.

To address the need for streamflow data, ADF&G is pursuing several actions. Since 2007, SF has provided annual funding for stream gaging efforts. These funds have been leveraged with USGS and other partners when possible, to maximize the collection of streamflow data[20]. Also, ADF&G, DNR, and USGS collaborated to implement a StreamStats[21] pilot project for the Cook Inlet region. StreamStats is a web-based, geographic information system (GIS) application developed by USGS in cooperation with Environmental Systems Research Institute, Inc. (ESRI). StreamStats allows users to obtain streamflow statistics and drainage-basin information for USGS data-collection stations and user-selected stream sites by incorporating a GIS program that delineates drainage basins and measures basin characteristics. After completion of the pilot project, USGS will evaluate the feasibility of statewide implementation.

RECOMMENDATIONS

- More streamgages are needed in Alaska to increase hydrologic baseline data across the state, especially in southwest, northwest and arctic regions.
- The relationship between instream flows and fish productivity needs to be more intensively researched. Ideally, investigations should be conducted over multiple life cycles and in areas not significantly influenced by human activities. The amount of available versus utilized habitat, and naturally occurring fish populations should be monitored to better understand fish habitat preferences. Research on key environmental parameters (e.g. ground water, water temperatures, turbidity, etc.) and how variation in these parameters influences fish productivity is also needed.
- The adequacy of ADF&G certificates of reservation should be re-assessed using the latest state-of-the-art method for the most important fisheries. If results indicate additional water should be reserved, a supplemental reservation of water application should be completed and filed.
- Out-of-stream appropriations should be automatically reviewed by DNR once every 10 years, similar to reservations of water. This would allow DNR to better manage Alaska's water resources and minimize or avoid water use conflicts.
- The purpose and benefits of instream flow education, training, and outreach should be re-evaluated. A fundamental goal commonly identified by instream flow practitioners' is to achieve public recognition of the importance of maintaining instream flows and lake levels to sustain healthy fish populations. A key step toward achieving this goal is

[20] Water bodies gaged include: Indian River, Situk River, Chatanika River, Mulchatna River, Stuyahok River, Ophir Creek, Wasilla Creek, Montana Creek, Stariski Creek, Goldstream Creek and Little Willow Creek.

[21] See http://water.usgs.gov/osw/streamstats/.

comprehensive outreach and incorporation of instream flow concepts and activities into education programs and school systems.

- Dedicated funding to the ACWA grant pool is needed to continue to meet ACWA's goal to address stewardship of Alaska's water bodies. Information about aquatic habitat issues is also needed to improve the ACWA database, which can range from fish habitat concerns to documented habitat degradation and can include field data, reports, or photographs.

The experience of other states shows that it is prudent to protect instream flows as early as possible; otherwise, water may become more scare and opportunities for protection more costly and contentious.

ACKNOWLEDGMENTS

To Bob Clark for his insights and assistance with the Unit and this report. To Monte Miller, Shawn Johnson, Jarrod Sowa, Tom Cappiello, Jason Mouw, and Jason Hass, ADF&G for their contributions and review. To Jeff Conaway, USGS and Kim Sager, DNR for their contributions. To the Division of Sport Fish biologist who responded to countless requests for information and to Joanne MacClellan for her invaluable expertise and patience throughout the writing process.

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FIGURES AND TABLES

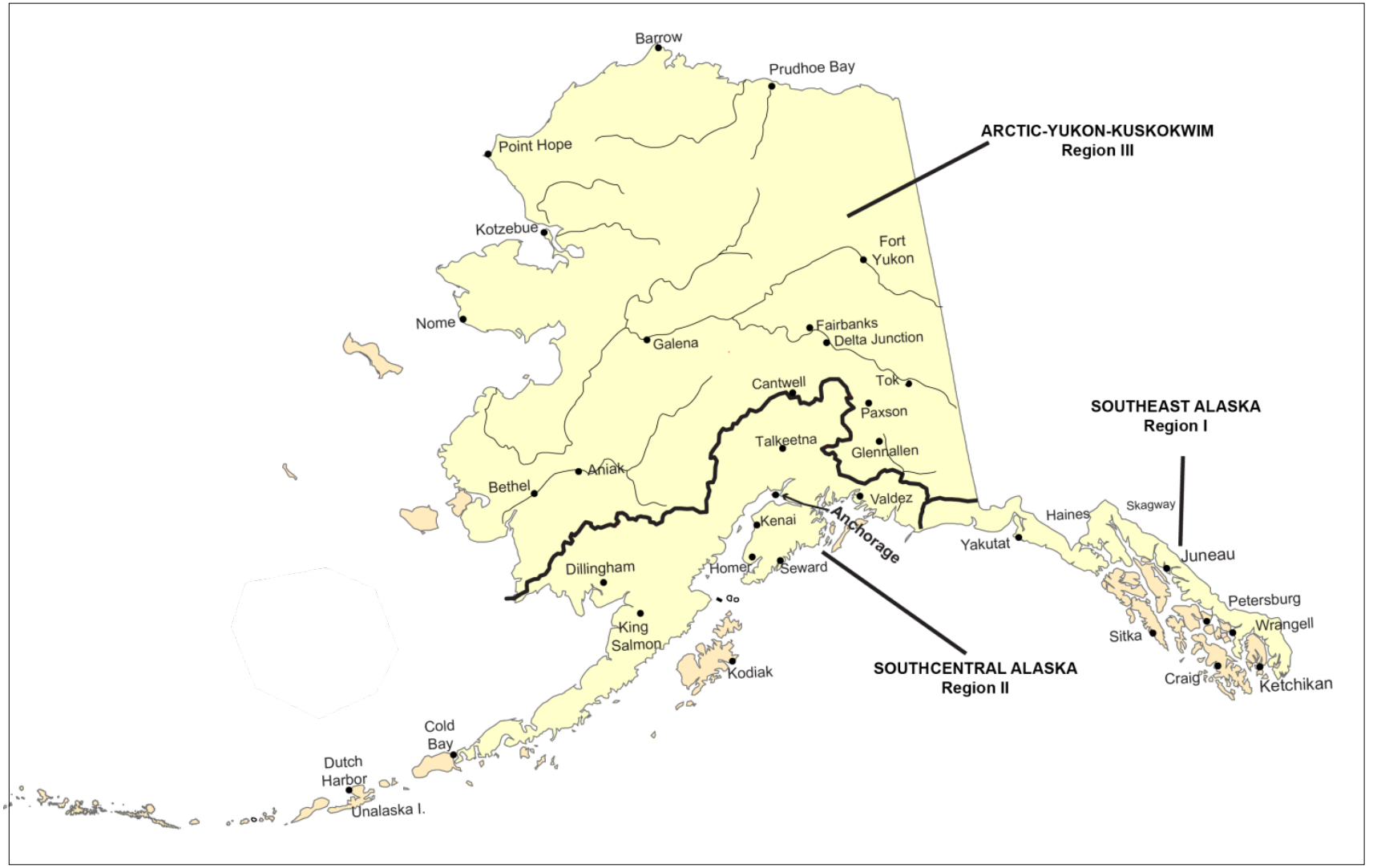

Figure 1.–Map of ADF&G, Division of Sport Fish regions in Alaska.

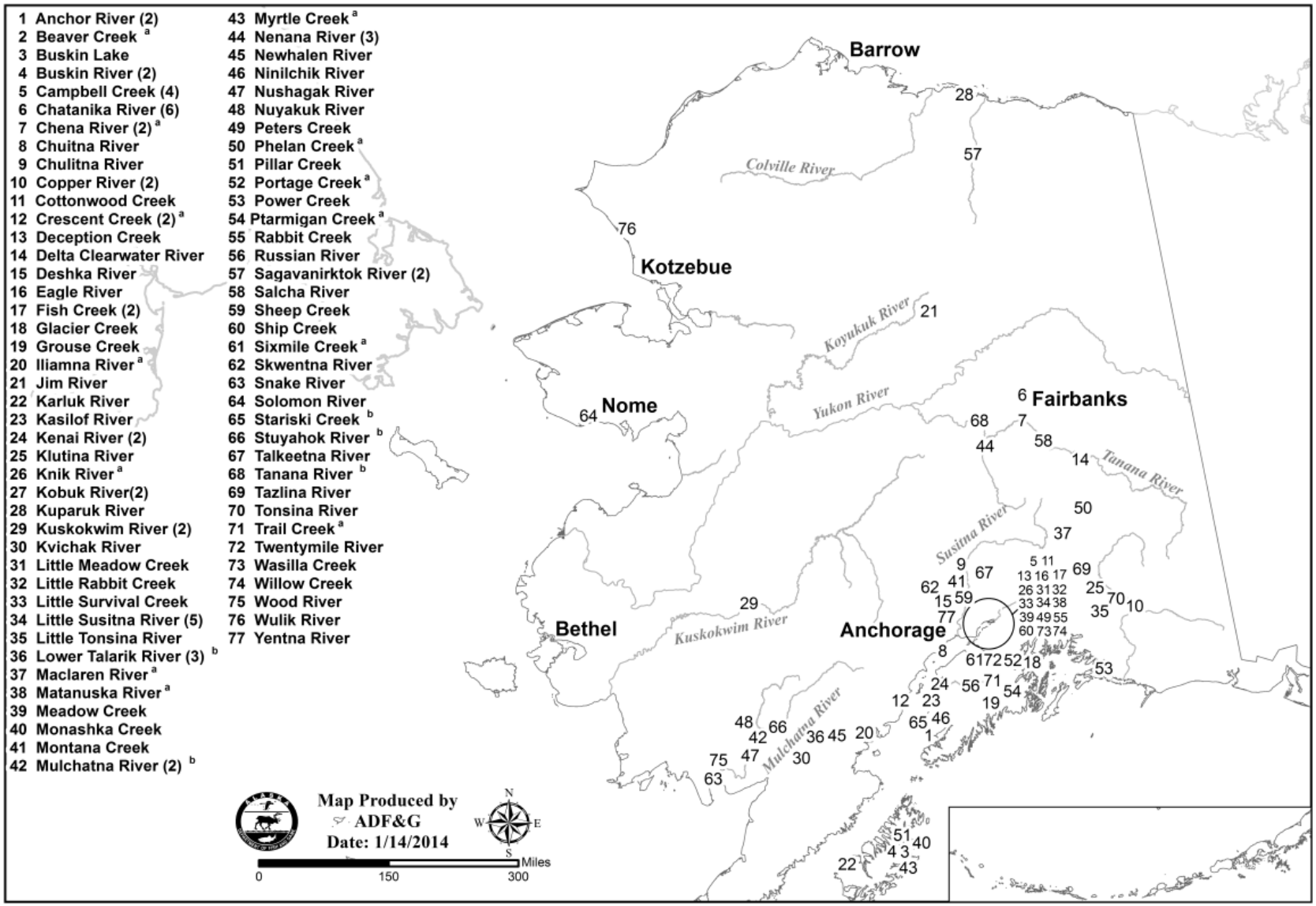

Figure 2.–Location of ADF&G reservation of water applications filed in Alaska except Southeast.

[a] = applications filed in 2013 ( ) = number of multiple applications filed for the site.

[b] = applications filed by ADF&G in cooperation with a private partner.

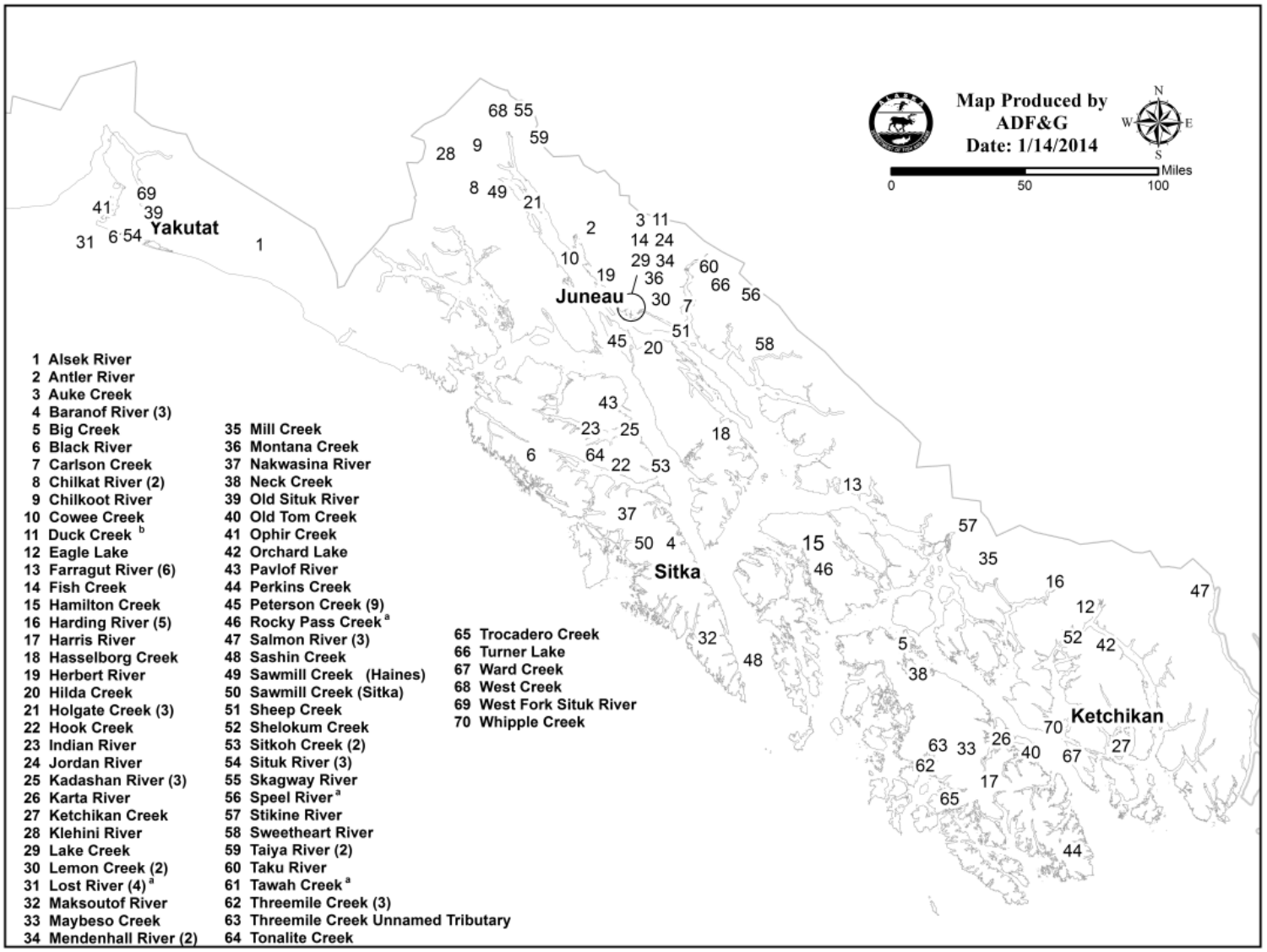

Figure 3.–Location of ADF&G reservation of water applications filed in Southeast Alaska.

[a] = applications filed in 2013 ( ) = number of multiple applications filed for the site

[b] = applications filed by ADF&G in cooperation with a private partner

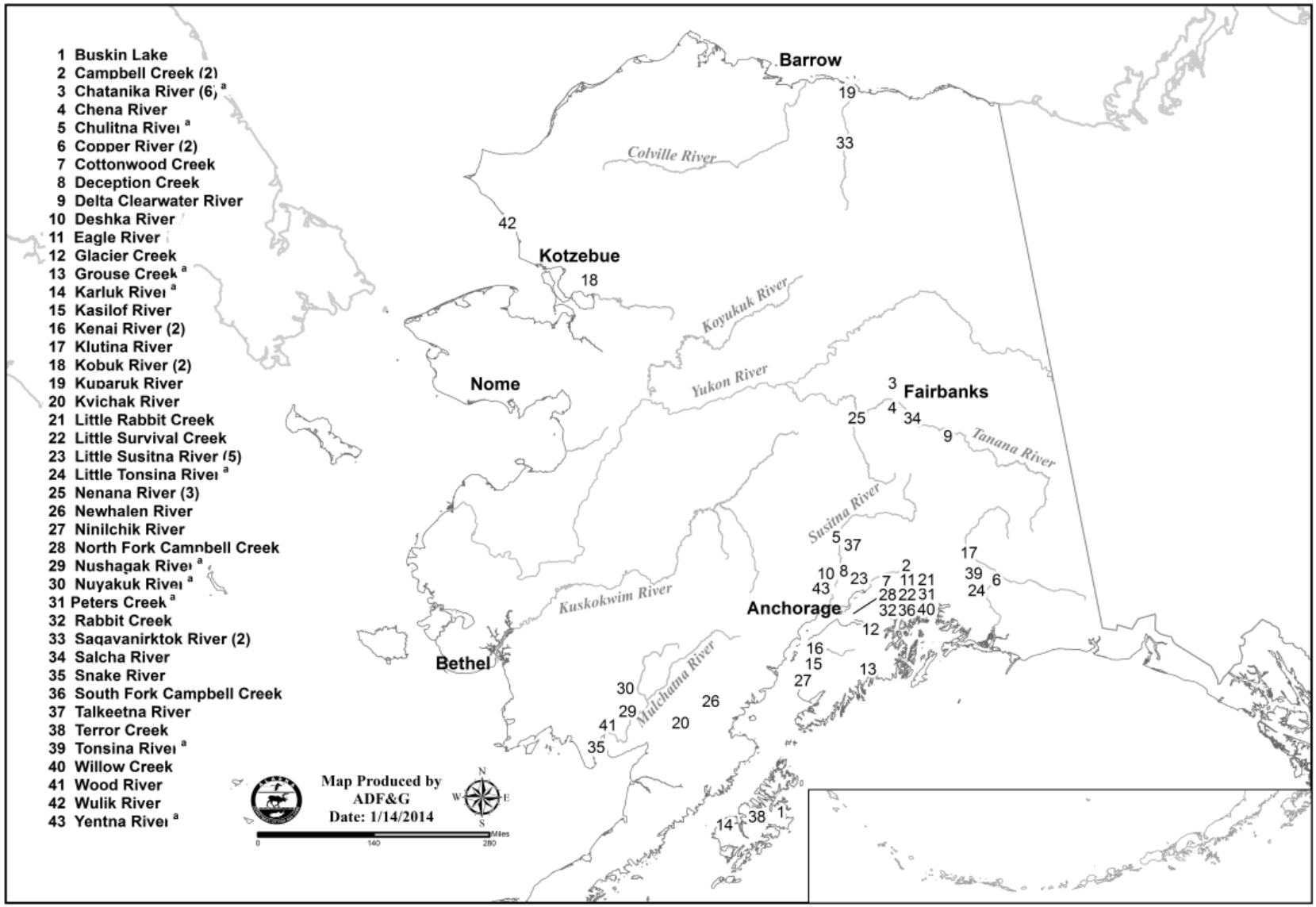

Figure 4.–Location of ADF&G certificates of reservation granted in Alaska except Southeast.

[a] = certificates granted 2013

( ) = number of multiple certificates granted for the site

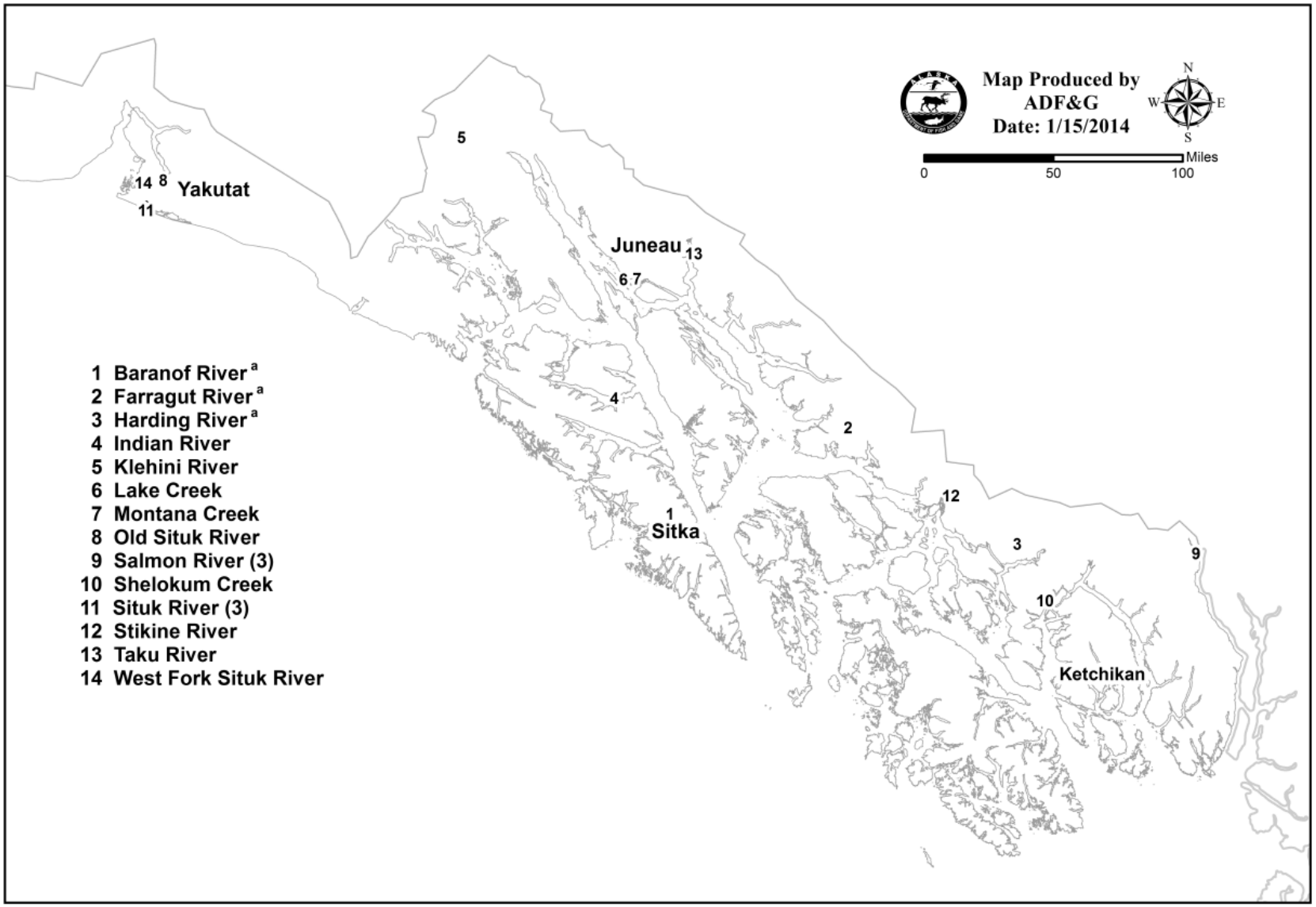

Figure 5.–Location of ADF&G certificates of reservation granted in Southeast Alaska.

[a] = certificates granted in 2013

( ) = number of multiple certificates granted for the site

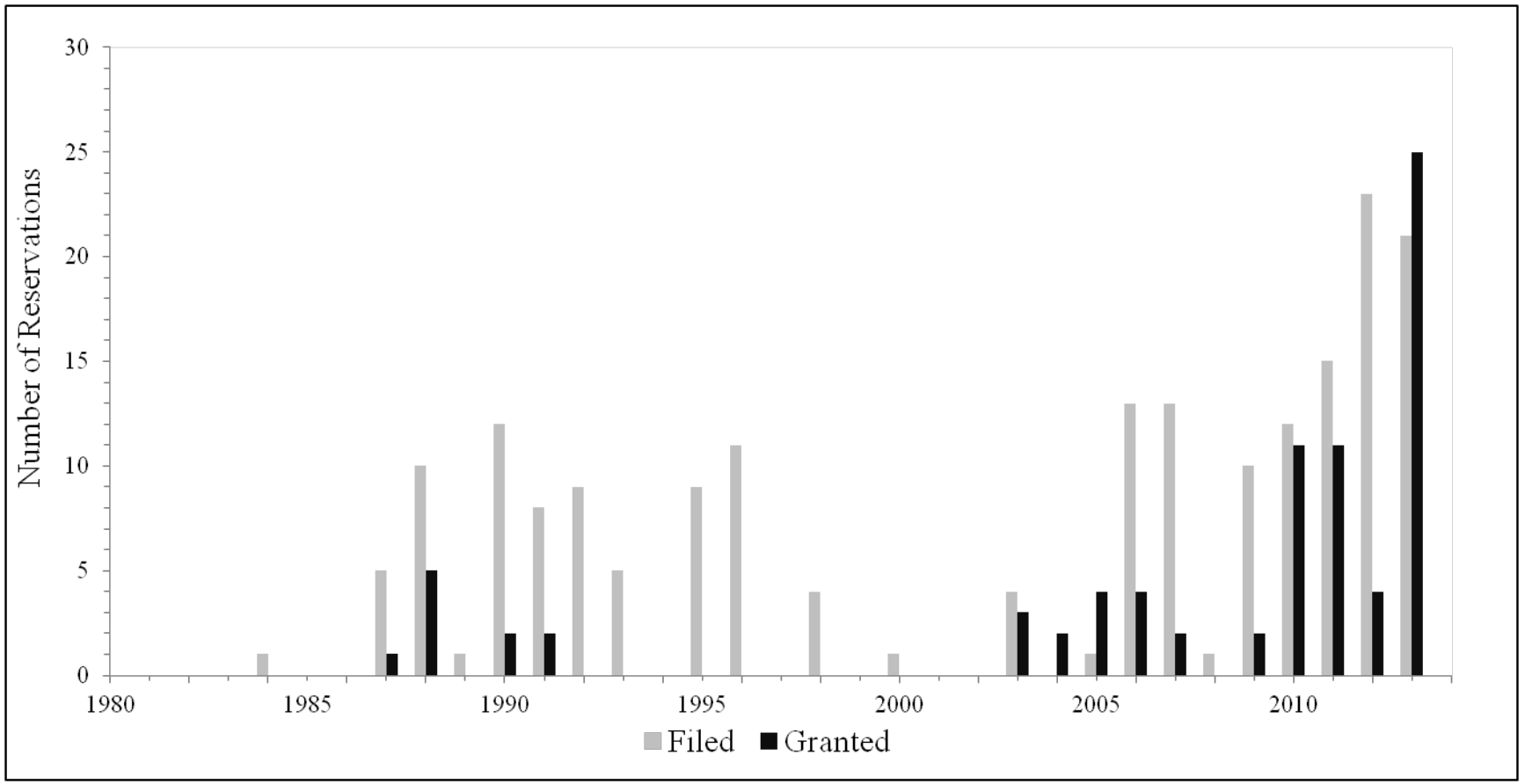

Figure 6.–Summary of ADF&G reservations filed and granted from 1980 to 2013 in Alaska.

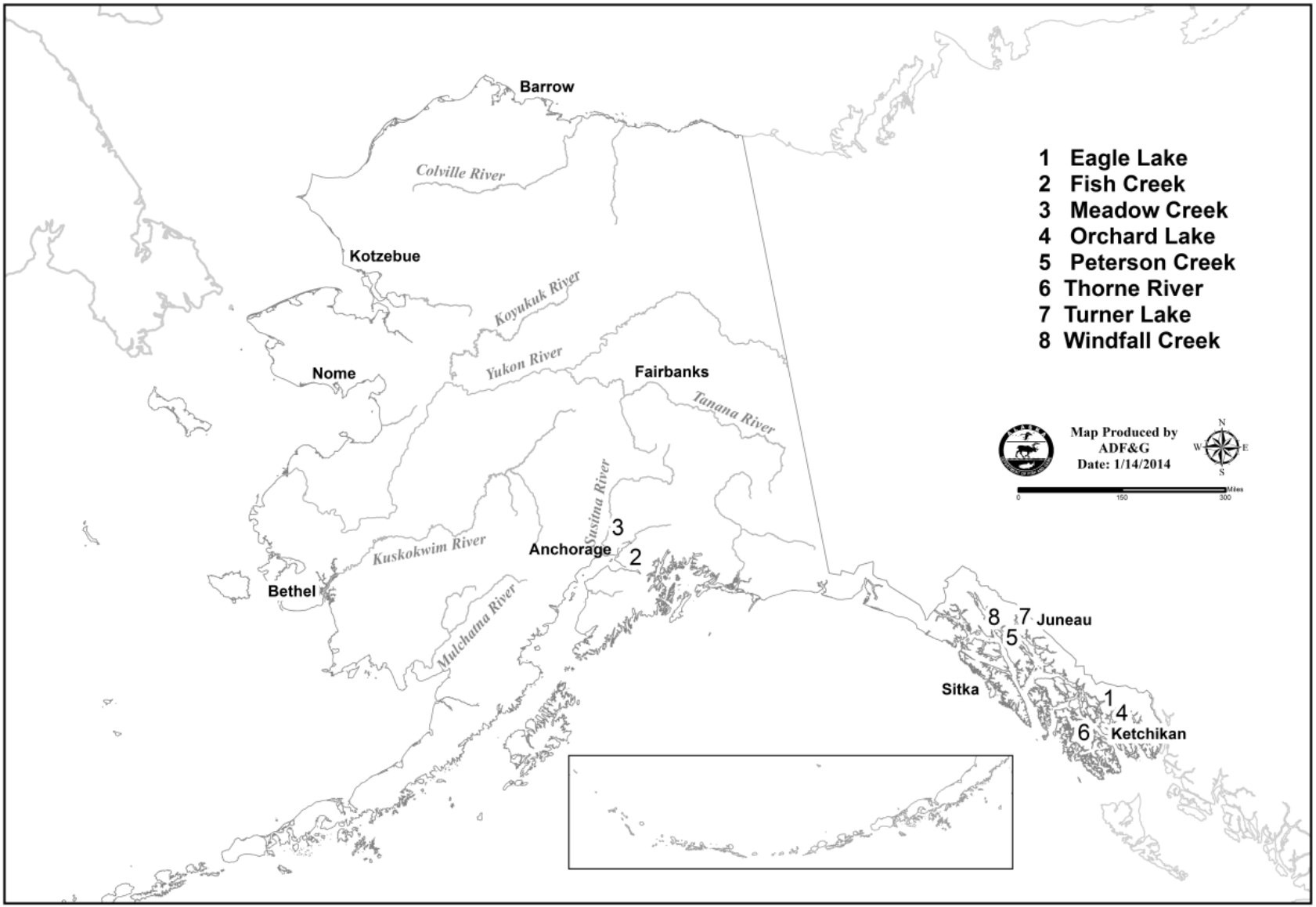

Figure 7.–Location of hydrologic investigations performed by ADF&G, Statewide Aquatic Resources Coordination Unit staff in 2013 in Alaska.

Table 1.–Summary of all reservation of water applications filed and granted in Alaska as of December 2013.

	Filed		Granted	
Organization	Rivers	Lakes	Rivers	Lakes
Alaska Department of Fish and Game (ADF&G)	206	4	79	1
U.S. Fish and Wildlife Service	61	140		
Bureau of Land Management	20		1	
Trout Unlimited	11			
Curyong Tribal Council-Trout Unlimited	10			
Chuitna Citizens Coalition	3			
Eklutna Native Village	3			
Southwest Alaska Salmon Habitat Partnership-ADF&G	3			
The Nature Conservancy-ADF&G	1			
Arctic Unit of the Alaska Chapter of the American Fisheries Society-ADF&G	1			
Trout Unlimited-ADF&G	1			
Cook Inletkeeper-ADF&G	1			
Cheesh-na Tribal Council	1			
Chickaloon Native Village	1			
Copper River Watershed Council		1		
Alaska Department of Fish and Game (per AS 46.15.035)[a]	NA	NA	1	1
Alaska Department of Natural Resources (per AS 46.15.035)[a]	NA	NA	2	2

Source: K. Sager, -Alaska Department of Natural Resources (DNR), January 2, 2014.

Note: NA = not applicable

[a] AS 46.15.035-refers to water exported out of one of the six defined hydrologic units that requires a mandatory reservation to protect fish resources.

Table 2.–Summary of ADF&G reservation of water applications filed in 2013 in Alaska.

DNR LAS No.[a]	Name	Priority Date
28855	Maclaren Creek	1/25/2013
28856	Phelan Creek	1/25/2013
28857	Sixmile Creek	1/25/2013
28858	Portage Creek	1/25/2013
28859	Beaver Creek	1/25/2013
28860	Knik River	1/29/2013
28861	Iliamna River	1/29/2013
28862	Matanuska River	1/29/2013
29052	Speel River	4/8/2013
29053	Rocky Pass Creek	4/8/2013
29092	Lost River Reach A	4/26/2013
29093	Lost River Reach B	4/26/2013
29095	Lost River Reach D	4/26/2013
29095	Tawah Creek	4/26/2013
29090	Chena River Reach B	4/29/2013
29091	Chena River Reach C	4/29/2013
29131	Crescent Creek Reach A	5/16/2013
29132	Crescent Creek Reach B	5/16/2013
29148	Ptarmigan Creek	5/22/2013
29149	Trail River	5/22/2013
29271	Myrtle Creek	8/1/2013

Note: See Figures 2 and 3 for site locations.

[a] The Land Administration System (LAS) is managed by DNR to provided case file summaries and abstracts of information depicted on the State Status Plat.

Table 3.–Summary of ADF&G reservation of water applications granted in 2013 in Alaska.

DNR LAS No.[a]	Name	Priority Date	Granted Date	Miles of Fish Habitat Protected
28241	Nushagak River	8/25/2011	11/1/2013	37.0
28250	Nuyakuk River	8/29/2011	11/7/2013	45.0
24380	Karluk River	7/28/2003	11/13/2013	24.0
28113	Chulitna River	6/16/2011	11/14/2013	27.0
26360	Harding River-Reach A	3/29/2007	11/14/2013	6.0
28484	Harding River-Reach B	3/29/2007	11/14/2013	4.0
28485	Harding River-Reach C	3/29/2007	11/14/2013	3.5
28486	Harding River-Reach D	3/29/2007	11/14/2013	3.3
28487	Harding River-Reach E	3/29/2007	11/14/2013	2.7
25695	Peter's Creek	5/11/2006	11/26/2013	2.7
28418	Grouse Creek	2/10/2012	11/26/2013	0.5
25692	Yentna River	5/11/2006	12/4/2013	25.0
27843	Tonsina River	9/30/2010	12/4/2013	42.0
27844	Little Tonsina River	9/30/2010	12/4/2013	16.0
13805	Baranof River	4/11/1990	12/11/2013	0.3
26386	Farragut River-Reach A	4/12/2007	12/11/2013	2.8
28230	Farragut River-Reach B	4/12/2007	12/11/2013	6.7
28231	Farragut River-Reach C	4/12/2007	12/11/2013	2.7
28235	Farragut River-Point D	4/12/2007	12/11/2013	-
13578	Chatanika River-Reach A	10/28/1991	12/17/2013	5.0
28388	Chatanika River-Reach B	12/19/2011	12/17/2013	7.5
28389	Chatanika River-Reach C	12/19/2011	12/17/2013	16.5
28390	Chatanika River-Reach D	12/19/2011	12/17/2013	13.0
28391	Chatanika River-Reach E	1/23/2012	12/17/2013	3.5
28392	Chatanika River-Reach F	10/28/1991	12/17/2013	5.0
			Total	301.7

Note: See Figures 4 and 5 for site locations.

[a] The Land Administration System (LAS) is managed by DNR to provided case file summaries and abstracts of information depicted on the State Status Plat.

Table 4.–Summary of FERC hydroelectric and hydrokinetic projects in Alaska monitored by ADF&G staff in 2013.

Project	FERC No.	Capacity (kW)	Status
Active Projects			
Southeast			
Armstrong - Keta	8875	80	Licensed Hydroelectric
Beaver Falls	1922	7,100	Licensed Hydroelectric
Black Bear	10440	4,500	Licensed Hydroelectric
Blind Slough/Crystal Lake	201	2,000	Licensed Hydroelectric
Blue Lake	2230	16,900	Relicensed Hydroelectric-Construction
Burnett River Hatchery	10773	80	Licensed Hydroelectric
Cascade Creek	14360	70,000	Proposed Hydroelectric
Dewey Lakes	1051	943	Licensed Hydroelectric
Falls Creek	11659	800	Licensed Hydroelectric
Gartina Falls	14066	600	Licensed Hydroelectric
Goat Lake	11077	4,000	Licensed Hydroelectric
Green Lake	2818	18,540	Licensed Hydroelectric
Jetty Lake	3017	249	Licensed Hydroelectric
Kasidaya	11588	3,000	Licensed Hydroelectric
Ketchikan Lakes	420	4,200	Licensed Hydroelectric
Lake 3160	12661	4,995	Proposed Hydroelectric
Lake Dorothy	12379	14,300	Licensed Hydroelectric
Mahoney Lake	11393	9,600	Under FERC Stay
Moira Sound Hydroelectric	14285	20,400	Proposed Hydroelectric
Pelican	10198	700	Licensed Hydroelectric
Reynolds Creek	11480	5,000	Licensed Hydroelectric-Construction
Salmon /Annex Creek	2307	6700/3600	Licensed Hydroelectric
Sheep Creek - Thane	14480	3,300	Proposed Hydroelectric
Soule River	12615	75,000	Proposed Hydroelectric
Swan Lake	2911	22,000	Licensed Hydroelectric
Sweetheart Lake	13563	20,000	Proposed Hydroelectric
Takatz Lake	13234	5,000	Proposed Hydroelectric
Tyee	3015	20,000	Licensed Hydroelectric
Walker Lake	14424	1,000	Proposed Hydroelectric
Whitman Lake	11841	4,600	Licensed Hydroelectric-Construction
Yakutat Wave Energy	14438	750	Proposed Hydrokinetic-Tidal

-continued-

Table 4.–Page 2 of 3.

Project	FERC No.	Capacity (kW)	Status
Southcentral			
Allison Lake	13124	6,500	Licensed Hydroelectric
Bradley Lake	8221	119,700	Licensed Hydroelectric
Chignik	620	60	Licensed Hydroelectric
Chikuminuk	14369	13,400	Proposed Hydroelectric
Cooper Lake	2170	19,380	Relicensed Hydroelectric-Construction
Dry Spruce	1432	75	Licensed Hydroelectric
East Forelands Tidal Energy	13821	100,000	Proposed Hydrokinetic-Tidal
Grant Lake Kenai Peninsula	13212	5,000	Proposed Hydroelectric
Humpback Creek	8889	1,250	Licensed Hydroelectric
Kvichak River-Igiugig	13511	4,000	Proposed Hydrokinetic-River
Old Harbor	13272	525	Proposed Hydroelectric
Pedro Bay	Not-Determined	Not-Determined	Proposed Hydroelectric
Power Creek	11243	6,000	Licensed hydroelectric
Solomon Gulch	2742	12,000	Licensed hydroelectric
Susitna-Watana	14241	600,000	Proposed Hydroelectric
Terror Lake	2743	33,750	Licensed Hydroelectric
Turnagain Arm #13509	13509	240,000	Proposed Hydrokinetic-Tidal
Interior			
Tanana River-Whitestone	13305	100	Licensed Hydrokinetic-River
Projects Surrendered, Expired or Cancelled			
Southeast			
Cascade Creek	12495	70,000	Proposed Hydroelectric
Connelly Lake	14229	12,000	Proposed Hydroelectric
Gastineau Channel	13606	400	Proposed Hydrokinetic-Tidal
Icy Passage	13605	300	Proposed Hydrokinetic-Tidal
Killisnoo Tidal Energy	13823	250	Proposed Hydrokinetic-Tidal
Ruth Lake	12619	20,000	Proposed Hydroelectric
Scenery Lake	12621/13365	30,000	Proposed Hydroelectric
Schubee Lake	13645	4,900	Proposed Hydroelectric
Yeldagalga Creek	14115	8,000	Proposed Hydroelectric
Southcentral			
Chakachamna Lake	12660	300,000	Proposed Hydroelectric
Cook Inlet, #12679	12679	1,000	Proposed Hydrokinetic-Tidal
DAHP Grant/Elva	14356	1700/1500	Proposed Hydroelectric
Tanana River-Nenana	13883	300	Proposed Hydrokinetic-River
Whittier Creek	13837	250	Proposed Hydroelectric

-continued-

Table 4.–Page 3 of 3.

Project	FERC No.	Capacity (kW)	Status
Declaration of Intents Issued			
Southeast			
Walker Lake	DI13-4-000	1,000	Proposed Hydroelectric
Southcentral			
Jacobs Creek	DI12-9-000	24	Proposed Hydroelectric

Table 5.–Summary of USGS streamgage sites in Alaska as of September 30, 2013.

Number of streamgages	Period of Record (Years)
20	0 < 1[a]
149	1 to < 5
99	5 to < 10
130	10 to < 20
109	20 to < 50
14	≥ 50
Total	521

Source: J. Conaway, USGS Hydrologist, Anchorage, Alaska, December 26, 2013, personal communication.

[a] The number of streamgages with less than one year of record are difficult to enumerate with existing database.

Table 6.–Summary of USGS streamgage sites operating in Alaska during water year 2013 (October 1, 2012 – September 30, 2013).

Region of State	Number of Sites
Southeast	24
Southcentral	48
Southwest, Northwest, Yukon and Arctic	51
Total Statewide	123

Source: J. Conaway, USGS Hydrologist, Anchorage, Alaska, December 26, 2013, personal communication.

APPENDIX A.
ALASKA CLEAN WATER ACTIONS GRANTS – FY13
PROJECT DESCRIPTIONS

Appendix A1.–Alaska Clean Water Actions Grants, FY13. Revised May 2012.

Below are the summaries of the Alaska Clean Water Actions (AWCA) Grants for projects starting July 2012 and finishing June 2013. The summaries are arranged by region of the state and include contact information for the group conducting the project.

Southeast Region

Auke Lake Water Quality Monitoring
Juneau Watershed Partnership (JWP), $19,000

This project addresses an ACWA Water body Protection priority. Auke Lake is a freshwater lake located approximately 12 miles north of downtown Juneau, Alaska. Auke Lake is a popular site for motorized summer recreation. JWP, in close coordination with the DEC, will develop and implement a water quality monitoring program for Auke Lake to collect data on petroleum hydrocarbon concentrations as compared to the Alaska Water Quality Standards. This data will be used to assess the summer pollutant loading to the lake primarily due to two-stroke engine use. To aid in the assessment, JWP will partner with the City and Borough of Juneau to conduct a recreational user survey designed to collect information on the motorized and non-motorized use on the lake. JWP will evaluate the water quality data and survey results and present them in a final project report. Contact: Eric Norberg, (907) 586-6853.

Juneau BEACH Monitoring Program – Year 2
Juneau Watershed Partnership (JWP), $22,229

This project addresses an ACWA Stewardship priority. JWP, in cooperation with the City and Borough of Juneau and the U.S. Forest Service, Tongass Ranger District, will monitor Auke Lake Recreation Area, Lena Cove, and Ann Coleman Road beaches for fecal bacteria pollution to evaluate possible risk to recreational users. These Juneau area beaches were identified by DEC as high priority because they are commonly used for contact recreation activities. Any events where bacterial levels exceed public health criteria will be evaluated for possible sources. If chronic bacterial exceedances are detected, further work may be necessary to confirm sources of pollution and prepare mitigation plans for affected areas, as appropriate. Contact: Erik Norberg, (907) 586-6853.

Klag Bay Educational Outreach
Alaska Environmental Restoration and Research, $8,400

This project addresses an ACWA Water body Restoration priority. The project implements activities identified in the Klag Bay total maximum daily load (TMDL) designed to increase public awareness of contaminants in the sediment of the Klag Bay area. The project involves posting large signs about the contaminants in the Klag Bay area developing. The signs will help to increase public awareness of the potential dangers of consuming shellfish that have been harvested from the contaminated sediment of Klag Bay. Contact: Alex Strawn, (907) 355-5395

Monitoring Bacteria Levels on Haines Beaches FY13
Takshanuk Watershed Council, $17,000

This project addresses an ACWA Stewardship priority. Beaches in the Haines area are increasingly used for recreation during the summer months as the long days draw both local residents and tourists to the beach for a variety of activities. This project will include fecal bacteria monitoring at two recreational beaches in the Haines Borough - Portage Cove and Lutak Beach. These beaches were identified by DEC as high priority because they are commonly used for recreation activities where people come in contact with the water. Through this project, the Takshanuk Watershed Council will (1) conduct a second year of bacteria water quality monitoring, (2) increase public awareness of potential bacterial sources and the health risks associated with bacterial contamination, and (3) work with the Haines Borough to limit beach access in the event of significant bacterial exceedances to ensure public health is protected. Contact: Brad Ryan, (907) 766-3542.

Mosquito Lake Water Quality and Invasive Plants
Takshanuk Watershed Council, $15,000

This project addresses an ACWA Water body Protection priority. Mosquito Lake is located in the Haines Borough and is an important recreational lake that provides habitat for bald eagles, trumpeter swans, coho and sockeye salmon, cutthroat and steelhead trout, Dolly Varden char, and whitefish. Suspected invasive plants such as Eurasian milfoil have been reported in the lake. This project will investigate the extent of milfoil coverage on the lake and conduct a feasibility study to determine the best approach to eradicate the milfoil as needed. The project will also conduct basic water quality monitoring, including monitoring for fecal coliform bacteria, and nutrients that may be linked to the excessive plant growth. A final project report of all results will be submitted. Contact: Brad Ryan, (907) 766-3542.

Pederson Hill Water Quality Monitoring
Juneau Watershed Partnership (JWP), $9,907

This project addresses an ACWA Water body Restoration priority. Pederson Hill Creek, located in Juneau, is included on the state list of impaired waters for contamination from fecal coliform bacteria. A total maximum daily load (TMDL) was established for the watershed in 2008. Failing septic systems were identified as the probable source of the pollution. Since the TMDL was issued, some of the area surrounding the creek has been connected to the City and Borough of Juneau's wastewater treatment system. JWP, in coordination with the DEC, will conduct water quality monitoring in Pederson Hill Creek to assess progress made towards water body recovery and meeting fecal coliform bacteria state water quality standards. A final project report of monitoring results will be submitted. Contact: Erik Norberg, (907) 586-6853.

Stormwater Master Plan and Management Guidelines
City and Borough of Sitka, $43,388

This project addresses an ACWA Stewardship priority and continues an FY12 project. The City and Borough of Sitka does not have a stormwater master plan or mapping program for protection of inland and coastal waters from stormwater runoff pollution. This project will fill that gap by (1) mapping and inventorying existing stormwater facilities; (2) identifying existing discharges, inadequate storm drains, and management measures to reduce polluted stormwater runoff; and (3) determining various maintenance, repair, and design alternatives to maximize the capabilities of the stormwater system. The project also includes hydrologic modeling to estimate stormwater runoff quantities and provides for long-term environmental stewardship. Contact: Stephen Weatherman, (907) 747-4042.

South-Central

Campbell Lake Water Quality Assessment
Aquatic Restoration and Research Institute (ARRI), $26,623

This project addresses an ACWA Water body Restoration priority. Campbell Creek and Campbell Lake are impaired water bodies with a total maximum daily load (TMDL) plan for fecal coliform bacteria. Other tributary streams to Campbell Lake are subjected to urban runoff and may be contributing additional pollutants that prevent water quality recovery in Campbell Lake. In particular, DEC has identified a specific tributary to Campbell Lake that may be water quality impaired. This small tributary receives runoff from commercial, industrial, and residential development. DEC has investigated the presence of orange floc of unknown origin. The tributary may also be contributing fecal coliform bacteria to Campbell Lake. The objective of this study is to determine if concentrations of fecal coliform bacteria and the abundance of organic floc in this small tributary exceed the state water quality standards through water quality sampling and assessment. A final project report of monitoring results will be submitted. Contact: Jeff Davis, (907) 733-5432.

Clean Boating on Big Lake
Cook Inletkeeper, $15,585

This project addresses an ACWA Water body Restoration priority and continues an FY12 project. Big Lake is a popular recreational lake in the Mat-Su Borough and an important economic asset to the Big Lake community. In 2006, Big Lake was listed as impaired (polluted) for petroleum hydrocarbons that exceeded state water quality standards. The source of the pollution is gasoline powered watercraft. Beginning in 2010, local community members and other stakeholders of Big Lake developed an Action Plan for reducing pollution in Big Lake through targeted public outreach and education. Using the Big Lake Action Plan as a guide, this project will address the goal of reducing pollution in Big Lake through a comprehensive educational clean boating campaign. This project has three objectives: (1) develop and

implement an educational clean boating program to ensure that boaters have locally available resources, know how to practice clean boating skills, and have an understanding of the negative impacts of petroleum on human health and fish habitat; (2) empower campground hosts and local business owners to encourage "Clean Boating on Big Lake"; and (3) implement best management practices to institutionalize pollution reduction practices under the Alaska Clean Harbors program at Big Lake marinas. Contact: Rachel Lord, (907) 235-4068 ext. 29.

Kenai River Watershed Monitoring
Kenai Watershed Forum, $28,272

This project addresses an ACWA Water body Protection priority and continues an FY12 project. The Kenai River is one of the premier commercial and sport fishing rivers in south-central Alaska. Water quality monitoring is an important aspect of river management that ensures water quality is maintained. This project continues the cooperative multi-agency effort for annual petroleum hydrocarbon sampling in the Kenai River watershed including 11 sites on the mainstem of the Kenai River and sites on 11 tributaries just upstream from where they enter the Kenai River during the peak power boat usage period. This water quality monitoring effort will verify that the Kenai River Water body Recovery Plan continues to be effective and that water quality standards continue to be met. A final project report of all data collected will be submitted. Contact: James Czarnezki, (907) 260-5478.

Kenai River Bacteria Monitoring,
City of Kenai, $61,566

This project addresses an ACWA Stewardship priority and continues FY12 work. Elevated levels of enterococci and fecal coliform bacteria were measured in samples at the mouth of the Kenai River. This project will monitor and test for bacteria at two locations at the mouth of the Kenai River (one site on the North Beach and one site on the South Beach) and at one upriver location near the Warren Ames Bridge (River Mile 5) to see if the beach management improvements have reduced the bacteria levels. Contact: Rick Koch, (907) 283-8222.

Mat-Su Stormwater Assessment
Aquatic Restoration and Resources (ARRI), $79,825

This project addresses an ACWA Stewardship priority and continues an FY11/12 project. The project continues work needed to collect data on Wasilla Creek, Cottonwood Creek and Little Meadow Creek to assess the effects of urbanization on water quality and fish habitat. All three creeks are important for salmon spawning and rearing. Wasilla Creek supports coho, Chinook, and chum salmon, and both Cottonwood Creek and Little Meadow Creek are lake-stream systems important for the spawning and rearing of sockeye salmon, coho salmon and resident rainbow trout. The project will (1) investigate where polluted stormwater impacts are occurring in the target waters, (2) assess the degree and extent of these impacts, and (3) determine what pollutants are of most concern and what the effects are to fish habitat. The information gained is

critical to understanding the impacts of pollutants transported by urban stormwater runoff on these salmon streams and will assist resource managers in making effective and targeted decisions to protect these fisheries from polluted stormwater runoff. Contact: Jeff Davis, (907) 733-5432.

Stream Temperature Monitoring Network – Cook Inlet
Cook Inletkeeper, $44,929

This project addresses an ACWA Stewardship priority and will complete a 5-year project. Water temperature is one of the most significant factors in the health of stream ecosystems. For salmon specifically, temperature affects survivorship of eggs and fry, rate of respiration and metabolism, timing of migration, and resistance to disease and pollution. Temperature plays a critical role in salmonid habitat protection, reproduction and survivorship. Wild, healthy salmon support vital sport, commercial, subsistence and personal use fisheries across Alaska. Therefore, the project addresses an urgent need to assess temperatures in Alaska salmon habitats. This project will (1) complete the final year of consistent data collection for the Stream Temperature Monitoring Network on 44 streams including Alexander Creek, Beaver Creek, Bishop Creek, Byers Creek, Cache Creek, Chenik Creek; Chester Creek, Chijuk Creek, Cottonwood Creek, Crooked Creek, Deception Creek, East Fork Chulitna River, English Bay River, Fish Creek, Fox Creek, Funny River, Hidden Creek, Jim Creek, Kroto (Deshka) Creek, Little Willow Creek, McNeil River, Meadow Creek, Montana Creek, Moose Creeks (Palmer & Talkeetna), Moose River, NF Campbell Creek, Nikolia Creek, Quartz Creek, Rabbit Creek, Resurrection Creek, Seldovia River, Shantatalik Creek, Ship Creek, Silver Salmon Creek, Slikok Creek, Soldotna Creek, Swanson River, Theodore River, Trapper Creek, Troublesome Creek, Wasilla Creek, and Willow Creek; (2) analyze 2012 temperature data to establish natural conditions; and (3) complete a comprehensive analysis of the 5-year data set collected. The Cook Inlet Stream Temperature Monitoring Network will allow fisheries managers and land-use planners to identify watershed characteristics with the greatest potential to buffer salmon habitats from high air and water temperatures. This project provides the knowledge and data needed to prioritize sites for future research, protection and restoration actions. Contact: Sue Mauger, (907) 235-4068 ext.24.

Little Susitna River Conservation
Palmer Soil and Water Conservation District (PSWCD), $7,000

This project addresses an ACWA Water body Protection priority and continues an FY12 project. The lower Little Susitna River is at risk of water quality impairment from petroleum hydrocarbon pollution and turbidity. This project continues the educational campaign on the impacts of petroleum and turbidity pollution to aquatic species and ways to reduce this pollution. The outreach campaign will build off DEC's current "*Fuel Out – Fish On!*" outreach message by distributing educational pamphlets at key locations in the Mat-Su area. In addition, one-on-one education of users of the lower Susitna River recreational fishery will be achieved by conducting three outreach weekends during the height of the coho fishery at the State-operated public use facility and boat launch. The goals of the project include improved water quality through a more educated boating public. A final project report summarizing results will be provided. Contact: Eric Wade, (907) 745-1441.